

## Case Report

# A case of thalamic hemorrhage with takotsubo cardiomyopathy

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**Case:** A 76-year-old woman was found unconscious by her family. She had suffered a fall and was soaked in kerosene. On arrival at our emergency department, she was unconscious, normotensive, with right hemiplegia and chemical burns. A computed tomographic scan of her head indicated left thalamic hemorrhage. An electrocardiogram showed ST elevation at the precordial leads. An echocardiogram revealed characteristic of takotsubo cardiomyopathy.

**Outcome:** The patient was intubated and treated conservatively. She was transferred to another hospital for rehabilitation after complete epithelization of the chemical burn. This is the second reported case of thalamic hemorrhage with takotsubo cardiomyopathy. The thalamic hemorrhage might have induced autonomic disturbances and caused the takotsubo cardiomyopathy in this case.

**Conclusion:** Physicians should pay attention to the potential complication of takotsubo cardiomyopathy, which may affect cardiopulmonary function even when patients are being treated for intracerebral hemorrhage.

**Key words:** Burn, stroke, takotsubo cardiomyopathy, thalamic hemorrhage

## INTRODUCTION

**T**AKOTSUBO CARDIOMYOPATHY IS a transient reversible cardiomyopathy that most commonly occurs in postmenopausal women, and is frequently precipitated by a stressful event.<sup>1</sup> Transient ST-segment elevation on electrocardiogram and a small increase in cardiac biomarkers are common, and characteristic wall motion abnormalities extend beyond the territory of a single epicardial coronary artery in the absence of obstructive coronary lesions.<sup>1</sup> Although the stress provoked by a stroke could lead to takotsubo cardiomyopathy, an association between subarachnoid hemorrhage and intracerebral hemorrhage and takotsubo cardiomyopathy is extremely rare.<sup>2–12</sup> We herein report a case of thalamic hemorrhage with takotsubo cardiomyopathy.

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## CASE

**A** 76-YEAR-OLD WOMAN WAS found unconscious by her family. She had suffered a fall and was soaked in kerosene. She had a prescription for hypertension and an old cerebral infarction. On arrival, she showed eye opening in response to painful stimuli, uttering inappropriate words and indeterminately was able to obey commands, which corresponded to a sum score of 11 on the Glasgow Coma Scale. Her vital signs were: blood pressure, 118/86 mmHg; pulse, 81 b.p.m.; body temperature, 37.0°C. She had isocoric reactive pupils, right hemiplegia (including her face), and diffuse erosions and blister formation on the chest (burn surface area 7%) and right forearm (burn surface area 1%). The remaining physiological findings were unremarkable. An arterial blood gas analysis with the patient receiving 5 L/min oxygen by a mask revealed a pH of 7.490, PCO<sub>2</sub> of 29.5 mmHg, PO<sub>2</sub> of 105 mmHg, and a base excess of 0.4 mmol/L. A complete blood count showed white blood cells at 6,300/mm<sup>3</sup>, red blood cells at 478 × 10<sup>4</sup>/mm<sup>3</sup> and platelets at 24.8 × 10<sup>4</sup>/mm<sup>3</sup>. The serum biochemical analyses revealed a total bilirubin level of 0.2 mg/dL, aspartate aminotransferase of 251 IU/L, alanine aminotransferase of 73 IU/L, blood urea nitrogen of 32.8 mg/dL, creatinine of 0.7 mg/dL, creatine phosphokinase of

16,488 IU/L, sodium of 138 mEq/L, potassium of 3.9 mEq/L, chloride of 102 mEq/L, and ammonia of 68 mg/dL.

A computed tomographic scan of the patient's head indicated a left thalamic hemorrhage that was estimated to have a volume of 10 mL (Fig. 1). An electrocardiogram showed ST elevation at the precordial leads (Fig. 2). An echocardiogram revealed left ventricular apical akinesia and basal hyperkinesis characteristic of takotsubo cardiomyopathy (Fig. 3). We did not measure the level of troponin T, because the troponin T assays yield false-positive results in patients with severe



**Fig. 1.** Computed tomographic scan of a 76-year-old woman, taken on arrival at the emergency department, who was unconscious and normotensive, with right hemiplegia and chemical burns. The scan of her head indicated a left thalamic hemorrhage with an estimated volume of 10 mL.

skeletal muscle injury because of the non-specific binding of skeletal muscle troponin T to the wall of the test tube.<sup>13</sup>

The patient was intubated and moved to the intensive care unit, and was conservatively treated by mechanical ventilation for the thalamic hemorrhage, chemical burn with rhabdomyolysis, and liver dysfunction. The electrocardiographic findings returned to normal on the third hospital day, and the chemical burn showed complete epithelization on the 10th hospital day. The tracheal tube was removed on the 13th hospital day, and the patient was transferred to another hospital for rehabilitation on the 40th hospital day.

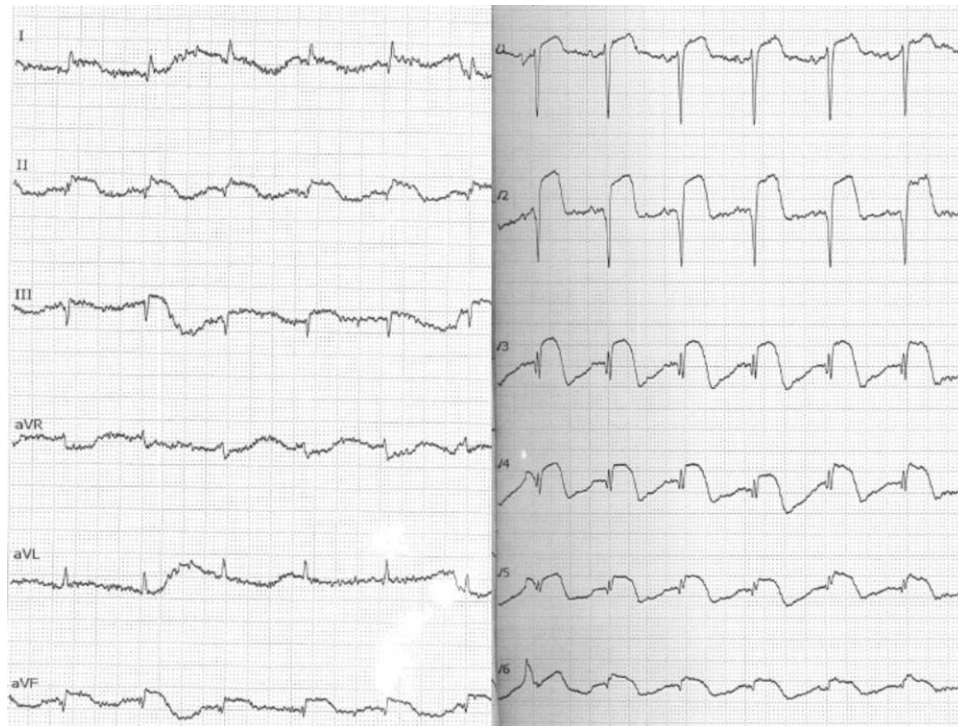
## DISCUSSION

MEDLINE AND ICHUSHI searches (Japania Centra Revuo Medicine; <http://login.jamas.or.jp/>), which collects summaries of Japanese medical articles, were undertaken to identify related articles published from 1983 to 2013 using the key words “takotsubo”, “stunned myocardium” and “stroke” or “intracerebral hemorrhage”. Additional articles were identified by a manual search of the references from the key articles. We found eight articles regarding intracerebral hemorrhage with takotsubo cardiomyopathy. We summarized these cases, including the present case, in Table 1.<sup>2–9</sup> Ours is the ninth reported case of intracerebral hemorrhage with takotsubo cardiomyopathy, and the second reported case of thalamic hemorrhage with takotsubo cardiomyopathy. All but one of the cases involved postmenopausal women. Six of the nine cases had intraventricular hemorrhage. Although the pathogenesis of takotsubo cardiomyopathy is not clear at present, myocardial ischemia caused by catecholamine-induced microvascular spasms or a neurogenic stunned myocardium triggered by psychological stress have been suggested to be involved.<sup>14</sup> The burn also induced

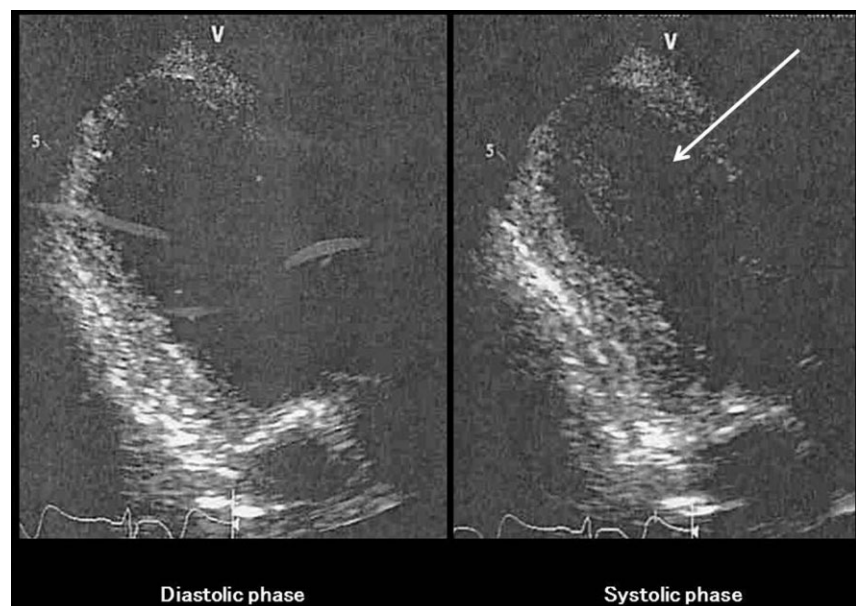
**Table 1.** Characteristics of patients with intracerebral hemorrhage with takotsubo cardiomyopathy, summarized from previously published reports and this study

No.	Author/year	Age, years	Sex	Location	IVH	Outcome
1	Takata/2003	52	Female	Temporal	+	Died
2	Deininger/2006	23	Male	Cerebellar	+	Survived
3	Rahimi/2008	70	Female	Thalamic	+	Survived
4	Izumi/2009	66	Female	Putamenal	–	Survived
5	Hassan/2010	84	Female	Cerebellar	+	Died
6	Mansencal/2011	89	Female	Frontal	–	Died
7	Tempaku/2012	71	Female	Cerebellar	+	Survived
8	Shiromoto/2012	94	Female	Cerebellar	–	Survived
Present		76	Female	Thalamic	–	Survived

IVH, intraventricular hemorrhage.



**Fig. 2.** Electrocardiogram of a 76-year-old woman, taken on arrival at the emergency department, who was unconscious and normotensive, with right hemiplegia and chemical burns. The electrocardiogram showed ST elevation at the precordial leads, excluding V<sub>1</sub>, and ST depression in the lead aV<sub>R</sub>.



**Fig. 3.** Echocardiogram of a 76-year-old woman, taken on arrival at the emergency department, who was unconscious and normotensive, with right hemiplegia and chemical burns. The echocardiogram revealed left ventricular apical akinesia (arrow) and basal hyperkinesis characteristic of takotsubo cardiomyopathy, which was not associated with the coronary artery distribution.

takotsubo cardiomyopathy, however, the burn in this case occurred after unconsciousness due to thalamic hemorrhaging, so that the psychological stress induced by the burn could be ignored.<sup>15,16</sup> Accordingly, the possibility of burn-induced takotsubo cardiomyopathy was minimized.

The modified Mayo Clinic criteria are frequently used as the gold standard to diagnose takotsubo cardiomyopathy.<sup>17</sup> According to these criteria, the identification of the absence of obstructive coronary artery disease is required. However, coronary angiography is an invasive procedure, and the combination of echocardiography, electrocardiography, and/or monitoring of the troponin level are widely available as first-line, non-invasive imaging techniques that can be used in the emergency setting to confirm the diagnosis.<sup>18–20</sup> Typically, electrocardiography reveals a combination of the presence of ST-segment depression in lead aV<sub>R</sub> and the absence of ST-segment elevation in lead V<sub>1</sub> in cases with takotsubo cardiomyopathy, and has been shown to have a sensitivity of 91%, a specificity of 96%, and a predictive accuracy of 95%.<sup>18</sup> Echocardiography in the present study revealed characteristic basal and midventricular segmental akinesis, which is not associated with the coronary artery distribution. In addition, the cardiac enzyme release is usually disproportionately low in relation to both electrocardiography changes and regional wall motion abnormalities. As a result, a diagnosis without coronary angiography has also been used in some recent reports, similar to our present case.<sup>11,12</sup>

Subarachnoid hemorrhage is associated with marked sympathetic activation at the time of ictus, and intravascular or cerebrospinal fluid catecholamine levels are elevated in subarachnoid hemorrhage patients who experience early mortality or disability.<sup>21</sup> Accordingly, a combination of subarachnoid hemorrhage and takotsubo cardiomyopathy was often observed, ranging from 4% to 15% of cases, and was especially noted in a severe case.<sup>10</sup> Yoshimura previously summarized cases of ischemic stroke associated with takotsubo cardiomyopathy.<sup>12</sup> In that report, postmenopausal female sex and insular or brain stem damage were predominant features of the stroke patients who developed takotsubo cardiomyopathy. According to his theory, the insular cortex or brain stem, which contains the nucleus ambiguus, the nucleus tractus solitarius, the dorsal motor nucleus of the vagus and the rostral ventrolateral medulla, controls the cardiovascular system through the afferent pathway from baroreceptors and the efferent pathway to the heart, vessels, and adrenal glands, resulting in it playing a major role in the autonomic control of cardiac activity. Thus, extensive insular or brainstem ischemia may induce autonomic disturbances and cause takotsubo cardiomyopathy. All of the cases summarized in Table 1 also had damage close to the insula or brainstem. In an experimental study,<sup>22</sup> it was shown that the

thalamus also influences the infralimbic and prelimbic areas, which was postulated to be the autonomic motor region. Consequently, the thalamic hemorrhage might have induced autonomic disturbances and caused the takotsubo cardiomyopathy in this case. However, the difference between this patient and typical patients with thalamic hemorrhage remains unclear.

## CONCLUSION

WHEN TAKOTSUBO CARDIOMYOPATHY is complicated, pulmonary edema, cardiogenic shock, respiratory failure, and arrhythmias may occur in the acute phase, potentially resulting in a fatal outcome.<sup>23</sup> Accordingly, physicians should pay attention to the potential complication of takotsubo cardiomyopathy, which may affect the cardiopulmonary function of patients even when they are being treated for an intracerebral hemorrhage.

## CONFLICT OF INTEREST

NONE.

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